Bridging and Routing Features for the Cisco uBR904 Cable Modem

The following sections are provided:

Feature Summary

The Cisco uBR904 cable modem is a fully-functional Cisco IOS router and standards-based Data-Over-Cable Service Interface Specification (DOCSIS) cable modem designed for use in small office/home office data-over-cable applications. It enables the delivery of secure, high-speed connections over small to medium-sized LANs. Downstream speeds up to 27 Mbps are supported using the 64-QAM modulation technique, or 40 Mbps using 256-QAM. On the upstream, the Cisco uBR904 can deliver 5 Mbps using Quadrature Phase-Shift Keying (QPSK) or 10 Mbps using 16-QAM.

The Cisco uBR904 is a compact device that supports the direct connection of up to four PCs and has the familiar features and programming interface of other routers in Cisco's extensive line of small- and medium-sized business product offerings. The Cisco uBR904 provides packet data transport and network address translation for TCP/IP applications between home or office computers and the cable headend.

You can configure your cable modem to act as a bridge or as a router. See Figure 1 and Figure 2. For more detailed descriptions of these options, see the "Configuration Options" section on page 7.

Figure 1 Cisco uBR904 in a Bridging Configuration

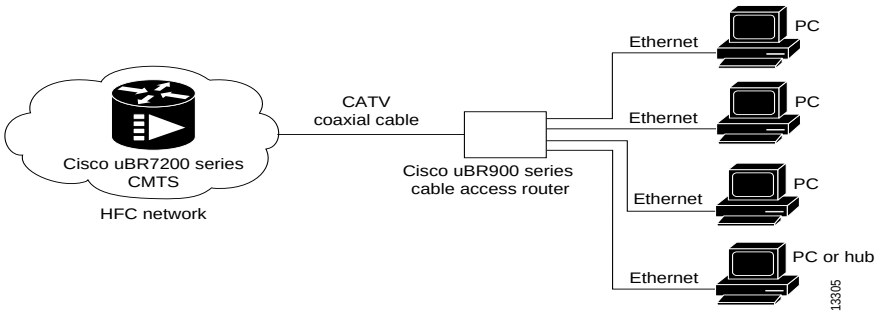
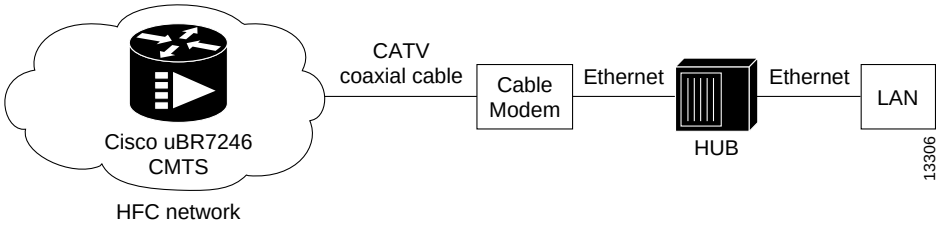


Figure 2 Cisco uBR904 in a Routing Configuration with a Hub



Benefits

The Cisco uBR904 cable modem provides the following benefits for data-over-cable applications:

- Enables the cost-effective deployment of advanced routing capabilities to the small office or home office site
- Provides a universal platform for deployment of both current and future modem technologies via modular upgrades while protecting the operator's invested capital
- Leverages Cisco's industry-standard routing hardware and Cisco IOS software to deliver advanced network services and applications

List of Terms

CATV—Originally stood for Community Antenna Television. Now refers to any coaxial or fiber cable-based system that provides television services.

Cable modem (CM)—Any device that modulates and demodulates digital data onto a CATV plant.

Cable router—A modular chassis-based router optimized for data-over-CATV hybrid fiber-coaxial (HFC) applications.

Channel—A specific frequency allocation and bandwidth. Downstream channels used for television in the United States are 6 MHz wide.

CM—Cable modem.

CMTS—Cable Modem Termination System. Any DOCSIS-compliant headend cable router, such as the Cisco uBR7246.

DHCP—Dynamic Host Configuration Protocol. This protocol provides a mechanism for allocating IP addresses dynamically so that addresses can be reused when hosts no longer need them.

DOCSIS—Data Over Cable Service Interface Specification. Defines technical specifications for equipment at both subscriber locations and cable operators' headends.

Downstream—The set of frequencies used to send data from a headend to a subscriber.

Headend—Central distribution point for a CATV system. Video signals are received here from satellite (either co-located or remote), frequency converted to the appropriate channels, combined with locally originated signals, and rebroadcast onto the HFC plant. For a CATV data system, the headend is the typical place to create a link between the HFC system and any external data networks.

HFC—Hybrid fiber-coaxial (cable network). Older CATV systems were provisioned using only coaxial cable. Modern systems use fiber transport from the headend to an optical node located in the neighborhood to reduce system noise. Coaxial cable runs from the node to the subscriber. The fiber plant is generally a star configuration with all optical node fibers terminating at a headend. The coaxial cable part of the system is generally a trunk-and-branch configuration.

Host—Any end-user computer system that connects to a network. In this document, the term host refers to the computer system connected to the LAN interface of the cable modem.

MAC layer—Media Access Control sublayer. Controls access by the cable modem to the CMTS and to the upstream data slots.

MCNS—Multimedia Cable Network System Partners Ltd. A consortium of cable companies providing service to the majority of homes in the United States and Canada. This consortium has decided to drive a standard with the goal of having interoperable cable modems.

MSO—Multiple Service Operator. A cable service provider that also provides other services such as data and/or voice telephony.

QAM—Quadrature Amplitude Modulation. A method of modulating digital signals onto a radio-frequency carrier signal involving both amplitude and phase coding. QAM is a modulation scheme mostly used in the downstream direction (QAM-64, QAM-256). QAM-16 is expected to be usable in the upstream direction. Numbers indicate number of code points per symbol. The QAM rate or the number of points in the QAM constellation can be computed by 2 raised to the power of <number of bits/symbol>.

QPSK—Quadrature Phase-Shift Keying. A method of modulating digital signals onto a radio-frequency carrier signal using four phase states to code two digital bits.

Ranging—The process of acquiring the correct timing offset such that the transmissions of a cable modem are aligned with the correct mini-slot boundary.

SID (Service ID)—A number that defines (at the MAC sublayer) a particular mapping between a cable modem (CM) and the CMTS. The SID is used for the purpose of upstream bandwidth allocation and class-of-service management.

Subscriber Unit (SU)—An alternate term for cable modem. See *cable modem.*

Upstream—The set of frequencies used to send data from a subscriber to the headend.

Platforms

The Cisco uBR904 cable modem is a standalone device; it works in conjunction with the Cisco uBR7246 universal broadband router.

Prerequisites

In order to use the Cisco uBR904 cable modem for data-over-cable applications, the following conditions must be met:

- The Cisco uBR7246 universal broadband router must be installed at the cable headend and configured. Refer to the *Cisco uBR7246 Installation and Configuration Guide* and the *Cisco uBR7246 Universal Broadband Router Cable Modem Card Installation and Configuration* for detailed information.
- The Cisco uBR904 cable modem must be physically installed and cabled as follows:
  - To the headend via CATV coaxial cable
  - To at least one PC via the straight-through yellow Ethernet cable supplied with the cable modem. Refer to the *Cisco uBR904 Cable Modem Installation and Configuration Guide* for detailed information.
- The PC(s) connected to the Cisco uBR904 cable modem must be configured for IP.
- The cable service provider must have a correctly configured network DHCP server and Electronic Industries Association (EIA) downstream channel.
- Cisco IOS Release 11.3(4)NA or later must be running on the Cisco uBR904 cable modem. When the cable modem is up and running, you can display the IOS release number by entering the **show version** command from user EXEC mode.

Note If the Cisco uBR7246 universal broadband router at the cable headend is using MC16 modem cards, Cisco IOS Release 11.3(7)NA or later must be running on the Cisco uBR904 cable modem.

Supported MIBs and RFCs

The Cisco uBR904 cable modem supports the following:

- Cisco Standard MIBs: Cisco Product MIB, Cisco Chassis MIB, Cisco Syslog MIB, Cisco Flash MIB, Bridge MIB, IF MIB, MIB-II.
- Radio Frequency Interface Specification—Developed by the Multimedia Cable Network System (MCNS) consortium. It defines the radio-frequency interface specification for high-speed data-over-cable systems.
- CiscoWorks—Network management program for planning, troubleshooting, and monitoring Cisco internetworks. CiscoWorks uses Simple Network Management Protocol (SNMP) to monitor all SNMP devices.
  - For more information about CiscoWorks on CCO, follow this path:
    Products & Ordering: Cisco Products: Network Management: CiscoWorks
  - For more information about CiscoWorks on the Documentation CD-ROM, follow this path:
    Cisco Product Documentation: Network Management: CiscoWorks
- Radio Frequency Interface (RFI) MIB—Specific to Data-Over-Cable Service Interface Specification (DOCSIS) cable implementations. The RIF MIB provides an interface that permits management of the Cisco uBR904 cable modem over the cable or Ethernet interface. Using SNMP management applications, this MIB allows access to statistics such as MAC, driver configuration, and counters.

- Cable Device MIB—Records statistics related to the configuration and status of the Cisco uBR904 cable modem. Statistics include an events log and device status. The Cable Device MIB is very similar to the RFI MIB in that both allow access to statistics; they are different in that the Cable Device MIB reports statistics on the cable modem, while the RFI MIB reports statistics on the radio frequency transmissions over the cable television line.

Functional Description

The Cisco uBR904 cable modem is the end-user part of the Cisco data-over-cable system; it is also referred to as a subscriber unit. The subscriber unit functions as an interface between the subscriber's personal computer(s) at the small office/home office and the cable operator's network (the headend).

The Cisco uBR904 has a single-cable F-connector interface for connection to the HFC network and a built-in Ethernet 10BaseT hub that provides four RJ-45 ports to which subscriber devices can be connected. All four ports are treated as one Ethernet interface by the Cisco IOS software. More hosts can be connected to the unit by connecting one of the 10BaseT ports to a hub. An additional RJ-45 port provides a console interface for configuration and diagnostic purposes.

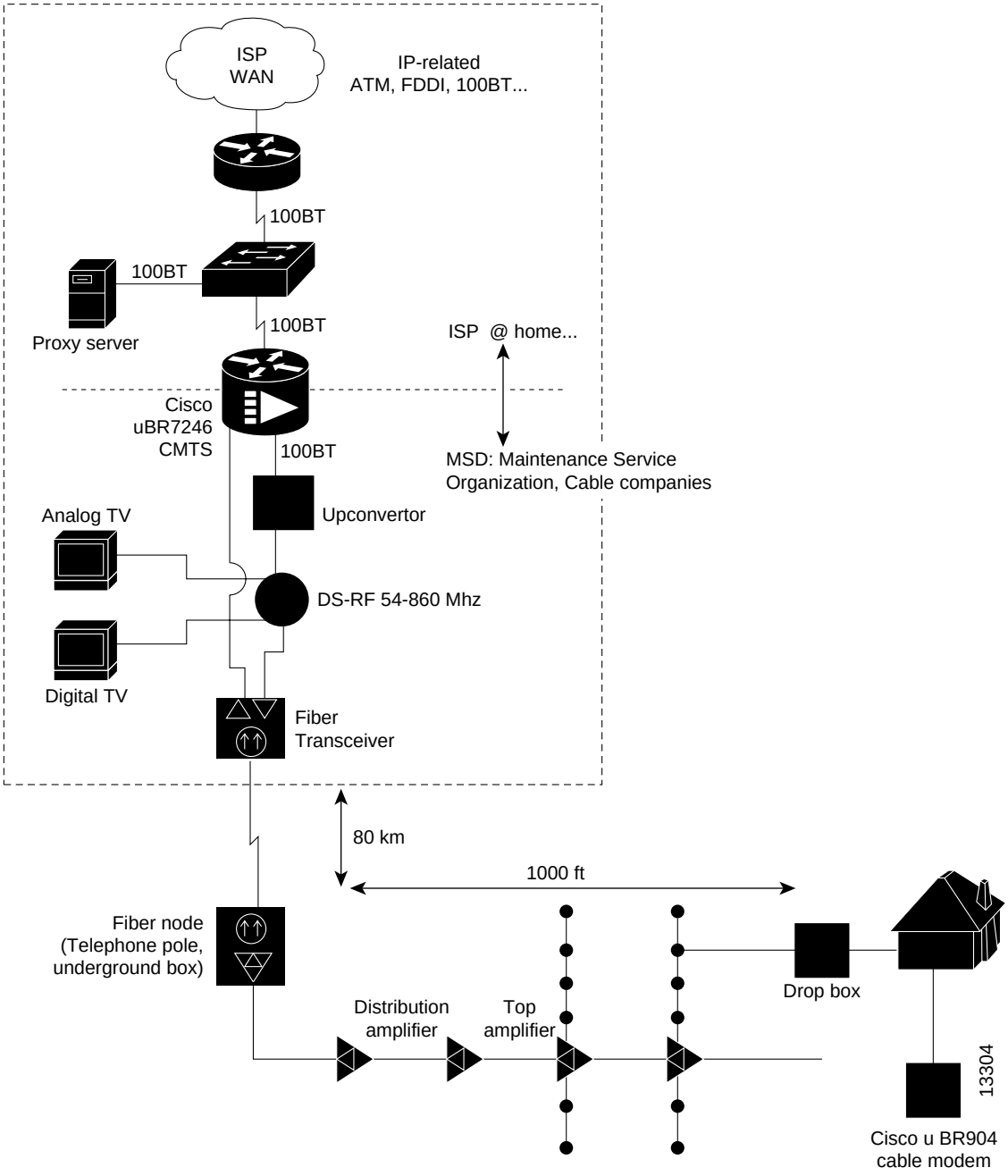
In compliance with MCNS requirements, the cable interface requires no configuration or setup procedures other than connecting the Cisco uBR904 to the cable system. The unit is configured automatically using a configuration file generated by the cable service provider and delivered via the Cisco uBR7246 universal broadband router installed at the cable headend. The headend router provides a path from the cable modem to the DHCP server for PC address assignment.

The personal computer(s) connected to the cable modem must be configured for Internet Protocol (IP). In addition, the cable service provider must have a correctly configured network Dynamic Host Configuration Protocol (DHCP) server and EIA downstream channel. Using DHCP, the universal broadband router assigns an IP address to the cable modem each time it connects to the network. The IP address identifies the computer on the network and enables the universal broadband router to route data to and from the PC.

After the cable modem is installed and the connected PC is configured for IP, and after DHCP services are enabled and communication to the headend is established, the Cisco uBR7246 universal broadband router downloads configuration information to the cable modem. The initial configuration connection to the headend can take several minutes.

See Figure 3 for a sample network topology.

Figure 3 CMTS to Cable Modem Network Sample Topology



Configuration Options

The Cisco uBR904 cable modem is usually configured automatically via a configuration file generated by the cable service provider; however, you can also manually configure the cable modem to function either as a bridge or as a router. The following sections give brief descriptions of both applications.

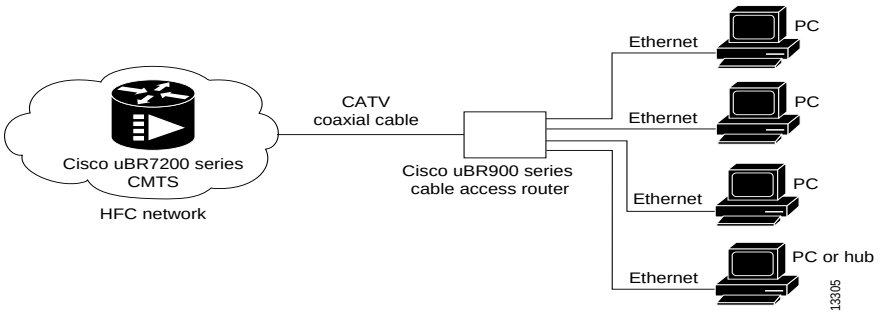
Note When the unit is shipped from the factory, it is configured for bridging by default.

Bridging

The Cisco uBR904 cable modem complies with the MCNS standards for interoperable cable modems; it supports full transparent bridging as well as DOCSIS-compliant transparent bridging.

In bridging applications, the Cisco uBR904 acts as a transparent bridge for up to three PCs plugged directly into three of the four Ethernet ports on the rear panel of the unit. The cable modem is connected to the Internet via the coaxial cable. All three Ethernet ports are treated as one Ethernet interface by the Cisco IOS software. The IP addresses for the PCs and the coaxial cable interface are in the same subnet.

Figure 4 Cisco uBR904 in a Bridging Configuration



DOCSIS-compliant transparent bridging is the default configuration of the Cisco uBR904 cable modem. If your cable service provider is using a DHCP server, all you need to do is connect the cables and power on the cable modem; your service provider's configuration program will automatically configure both the coaxial cable interface and the bridging functionality. You do not need to set up IP addresses for the attached PCs or enter any Command Line Interface (CLI) configuration commands. This type of operation is called plug-and-play bridging.

In addition to the plug-and-play method, you can configure a bridging application on the Cisco uBR904 using one of the following methods:

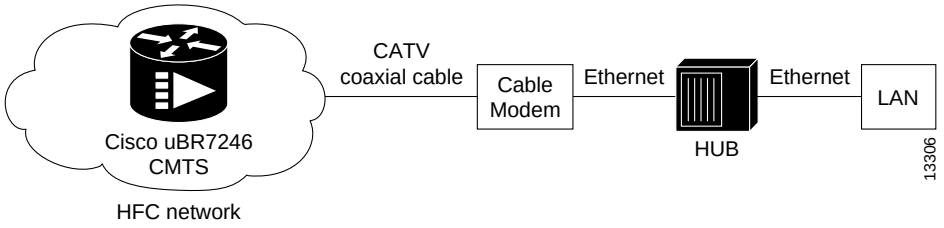
- **Manual** configuration using the CLI. See the sections "Configuring Bridging" on page 13 and "Customizing the Cable Modem Interface" on page 16 for details.
- **Advanced** configuration using the System Configuration dialog box in the setup facility. See the chapter "Configuring Advanced Routing or Bridging Using Setup" in the *Cisco uBR904 Cable Modem Installation and Configuration Guide* for details.

Routing

In this application, the cable modem acts as a router to connect to existing networks. A typical use would be if you are connecting the cable modem to an internal Ethernet hub that is connected to an existing PC network. You can also connect the cable modem directly to as many as four PCs via the Ethernet ports on the rear panel.

The cable modem is automatically configured to use the IP address of the Cisco uBR7246 headend cable router as the cable modem's default IP gateway.

Figure 5 Cisco uBR904 in a Routing Configuration with a Hub



You can configure the Cisco uBR904 cable modem to function like a router using one of the following methods:

- **Manual** configuration using the CLI. See the sections "Configuring a Host Name and Password" on page 9 and "Customizing the Cable Modem Interface" on page 16 for details.
- **Advanced** configuration using the System Configuration dialog box in the setup facility. See the chapter "Configuring Advanced Routing or Bridging Using Setup" in the *Cisco uBR904 Cable Modem Installation and Configuration Guide* for details.

Configuration Tasks

The Cisco uBR904 cable modem typically is configured automatically on power-up using a configuration file generated by the cable service provider and delivered via the Cisco uBR7246 universal broadband router installed at the cable headend. All of the configuration tasks listed below are optional.

Note Console sessions and TTY sessions are supported by the cable modem.

Configuring a Host Name and Password

One of the first configuration tasks you might want to perform is to configure a host name and set an encrypted password. Configuring a host name allows you to distinguish multiple Cisco uBR904 cable modems from each other. Setting an encrypted password allows you to prevent unauthorized configuration changes.

Note Passwords are case sensitive.

To configure a host name and an encrypted password for a Cisco uBR904 cable modem, perform the following tasks, starting in global configuration mode:

Step	Command	Purpose
1	`uBR904(config)# hostname cisco` `cisco(config)#`	Change the name of the uBR904 to a meaningful name. Substitute your host name for **cisco**.
2	`cisco(config)# enable secret guessme`	Enter an enable secret password. This password provides access to enable (privileged EXEC) mode. After configuring a password, when you enter **enable** at the EXEC prompt, you must enter the enable secret password to gain access to configuration mode. Substitute your enable secret password for **guessme**.
3	`cisco(config)# line console 0`	Enter line configuration mode to configure the console port.
	`cisco(config-line)# exec-timeout 0 0`	Prevent the EXEC facility from timing out if you do not type any information on the console screen for an extended period.
	`cisco(config-line)# exit` `cisco(config)#`	Exit back to global configuration mode.

Verifying the Host Name and Password

To verify that you configured the correct host name and password, enter the **show running-config** command from global configuration mode:

```
cisco(config)# show running-config
Using 1888 out of 126968 bytes
!
version XX.X
.
.
!
hostname cisco
!
enable secret 5 $1$60L4$X2JYOwoDc0.kqa1loO/w8/
```

- Check the host name and encrypted password displayed near the top of the command output.

- Exit global configuration mode and attempt to reenter it using the new enable password:

```
cisco# exit

cisco con0 is now available
Press RETURN to get started.
cisco> enable
Password: guessme
cisco#
```

Troubleshooting Tips

If you are having trouble:

- Make sure **Caps Lock** is off.
- Make sure you entered the correct passwords. Passwords are case sensitive.

Configuring Ethernet and Cable Modem Interfaces

To assign an IP address to the Ethernet or cable modem interface so that it can be recognized as a device on the Ethernet LAN, perform the following tasks, starting in global configuration mode:

Step	Command	Purpose

1	`uBR904(config)# interface ethernet 0`
	
	`or`
	
	`uBR904(config)# interface modem-cable0`
	
	`uBR904(config-if)#`
		Enter interface configuration mode for the Ethernet and/or the cable modem interface.

2	`uBR904(config-if)# ip address 172.16.1.1 255.255.255.0`	Assign the appropriate IP address and subnet mask to the interface.

3	`uBR904(config-if)# Ctrl-Z`
	`uBR904#`
	
	`%SYS-5-CONFIG_I: Configured from console by console`
		Return to privileged EXEC mode.
		
		This message is normal and does not indicate an error.

Verifying IP Address Configuration

To verify that you have assigned the correct IP address, enter the **show arp** command:

```
uBR904# show arp
Protocol  Address     Age (min)  Hardware Addr   Type   Interface
Internet  172.16.1.1        -    0009.0613.6030  ARPA   cable-modem0
Internet  4.0.0.28          -    00e0.1ed7.524d  ARPA   Ethernet0
```

Troubleshooting Tips

If you are having trouble:

- Make sure you are using the correct IP address.
- Make sure the cable interface is not shut down. Use the **show running-config** command to check the cable interface status.

Configuring Routing

If you have one or more PCs directly connected to your cable modem, you can change the cable modem's configuration from bridging to routing. When configured as a bridge, the cable modem can have a maximum of three PCs directly connected; when configured as a router, it can have four PCs directly connected. See the "Configuration Options" section on page 7 for details on both of these configurations.

To configure the Cisco uBR904 cable modem for routing, perform the following tasks, starting in global configuration mode:

Step	Command	Purpose
1	`uBR904(config)#`**`interface cable-modem0`**	Enter interface configuration mode for the cable modem interface.
2	`uBR904(config-if)#`**`no cable-modem compliant bridge`** `uBR904(config-if)#`**`end`**	Turn off MCNS auto-configured bridging. Return to global configuration mode.
3	`uBR904(config)#`**`ip routing`**	Enable IP routing for the cable modem.
4	`uBR904(config)#`**`router rip`**	Enter router configuration mode and enable Routing Information Protocol (RIP) on the cable modem.
5	`uBR904(config-router)#`**`network`** *`network-number`*	Specify the network connected to the cable modem on which the RIP process will operate. If the cable modem is attached to more than one network, enter each IP address in a separate command.
6	`uBR904(config-router)#`**`end`** `uBR904(config)#`**`interface cable-modem0`**	Exit router configuration mode. Return to interface configuration mode for the cable modem interface.
7	`uBR904(config-if)#`**`ip rip receive v 2`**	Specify that only RIP Version 2 packets will be received on the coaxial cable interface.
8	`uBR904(config-if)#`**`ip rip send v 2`**	Specify that only RIP Version 2 packets will be sent on the coaxial cable interface.
9	`uBR904(config-if)#`**`end`** `uBR904(config)#`**`interface ethernet0`**	Exit interface configuration mode for the cable modem interface and enter interface configuration mode for the Ethernet0 interface.
10	`uBR904(config-if)#`**`ip rip receive v 2`**	Specify that only RIP Version 2 packets will be received on this Ethernet interface.
11	`uBR904(config-if)#`**`ip rip send v 2`**	Specify that only RIP Version 2 packets will be sent on this Ethernet interface.
12	`uBR904(config-if)#`**`Ctrl-z`** `uBR904#`**`copy running-config startup-config`** `Building configuration...`	Return to privileged EXEC mode. Save the configuration to nonvolatile RAM so that it won't be lost in the event of a reset, power cycle, or power outage.

Verifying Routing

To verify that bridging is not configured, routing is enabled, and that Routing Information Protocol is configured on the interfaces, enter the **show startup-config** command:

```
uBR904# show startup-config
Building configuration...

Current configuration:
!
version 12.0
no service pad
no service password-encryption
service udp-small-servers
service tcp-small-servers
!
hostname ubR904
!
!
ip host sw-lab-fw 4.0.0.1
ip domain-name cisco.com
ip name-server 171.69.209.10
clock timezone EST 2
!
!
interface Ethernet0
 ip address 4.0.0.33 255.0.0.0
 ip rip send version 2
 ip rip receive version 2
 no keepalive
!
interface cable-modem0
 ip address 172.16.1.42 255.255.0.0
 ip rip send version 2
 ip rip receive version 2
 no keepalive
 cable-modem downstream saved channel 699000000 39
 cable-modem downstream search-band 88 453000000 855000000 6000000
 cable-modem downstream search-band 89 93000000 105000000 6000000
 cable-modem downstream search-band 90 111250000 117250000 6000000
 cable-modem downstream search-band 91 231012500 327012500 6000000
 cable-modem downstream search-band 92 333015000 333015000 6000000
 cable-modem downstream search-band 93 339012500 399012500 6000000
 cable-modem downstream search-band 94 405000000 447000000 6000000
 cable-modem downstream search-band 95 123015000 129015000 6000000
 cable-modem downstream search-band 96 135012500 135012500 6000000
 cable-modem downstream search-band 97 141000000 171000000 6000000
 cable-modem downstream search-band 98 219000000 225000000 6000000
 cable-modem downstream search-band 99 177000000 213000000 6000000
 cable-modem downstream search-band 100 91000000 860000000
!
router rip
 network 4.0.0.0
 network 172.16.0.0
!
ip default-gateway 172.16.1.1
ip classless
!
line con 0
line vty 0 4
 login
!
end
```

Configuring Bridging

The Cisco uBR904 cable modem is configured for bridging by default. If it becomes necessary to *reconfigure* the unit for bridging after it has been configured for routing, you can erase the routing configuration and return the unit to factory default configuration settings, or you can reconfigure the unit manually using the CLI. To return the cable modem to factory default settings, see the section "Reestablishing Plug-and-Play Bridging" on page 15 for details. To reconfigure the cable modem manually, perform the following tasks, starting in global configuration mode:

Step	Command	Purpose
1	`uBR904(config)#`**`no service pad`**	Disable packet assembler/disassembler commands; prevent the uBR904 from accepting incoming or outgoing Packet Assembler/Disassembler (PAD) connections.
2	`uBR904(config)#`**`no service password-encryption`**	Disable password encryption.
3	`uBR904(config)#`**`no ip routing`**	Disable IP routing on the uBR904.
4	`uBR904(config)#`**`interface Ethernet0`**	Enter interface configuration mode for the Ethernet0 interface.
5	`uBR904(config-if)#`**`no ip route-cache`**	Disable high-speed switching caches for IP routing.
6	`uBR904(config-if)#`**`bridge-group`** *`bridge-group`*	Assigns the Ethernet0 interface to a bridge group. The bridge group must be an integer between 1 and 63.
7	`uBR904(config-if)#`**`bridge-group`** *`bridge-group`* **`spanning-disabled`**	Disable spanning tree on the Ethernet interface.
8	`uBR904(config-if)#`**`end`** `uBR904(config)#`**`interface cable-modem0`**	Exit interface configuration mode for the Ethernet0 interface and enter interface configuration mode for the cable modem interface.
9	`uBR904(config-if)#`**`no ip address`**	Disable the IP address of the coaxial cable interface, if one has been set. The uBR7246 cable router assigns an IP address to the cable modem each time it connects to the network.
10	`uBR904(config-if)#`**`no ip route-cache`**	Disable high-speed switching caches for IP routing on the cable interface.
11	`uBR904(config-if)#`**`no keepalive`**	Disable keepalives on the cable interface.
12	`uBR904(config-if)#`**`bridge-group`** *`bridge-group`*	Assign the cable modem interface to a bridge group. The bridge group must be an integer from 1 to 63. (The default is 59.)
13	`uBR904(config-if)#`**`bridge-group`** *`bridge-group`* **`spanning-disabled`**	Disable spanning tree on the cable interface.
14	`uBR904(config-if)#`**`end`** `uBR904(config)#`**`ip classless`**	Exit interface configuration mode. (Optional) At times, the uBR904 might receive packets destined for a subnet of a network that has no network default route. This global configuration mode command allows the Cisco IOS software to forward such packets to the best network route possible.
15	`uBR904(config)#`**`line console 0`**	Enter line configuration mode to configure the console port.

Step	Command	Purpose
16	uBR904(config-line)#**line vty 0 4**	Identify the last line in a contiguous group of virtual terminals you want to configure.
17	uBR904(config-line)#**Ctrl-z** uBR904#**copy running-config startup-config** Building configuration...	Return to privileged EXEC mode. Save the configuration to nonvolatile RAM so that it won't be lost in the event of a reset, power cycle, or power outage.

When the cable interface comes up, the IP address and downstream channel are configured automatically.

Note To configure multiple PCs, repeat Steps 4 through 7 above for each additional PC. You can connect a maximum of three PCs to the Cisco uBR904 cable modem in a bridging application.

Verifying Bridging

To verify that routing has been disabled on all interfaces and that bridging has been reenabled, enter the **show startup-config** command from privileged EXEC mode:

```
uBR904# show startup-config
Building configuration...
Current configuration:
!
version 12.0
no service pad
no service password-encryption
!
hostname uBR904
!
no ip routing
!
interface Ethernet0
 no ip address
 no ip route-cache
 bridge-group 59
 bridge-group 59 spanning-disabled
!
interface cable-modem0
 no ip address
 no ip route-cache
 no keepalive
 cable-modem downstream saved channel 699000000 36
 bridge-group 59
 bridge-group 59 spanning-disabled
!
ip classless
!
line con 0
line vty 0 4
 login
!
end
```

Reestablishing Plug-and-Play Bridging

To erase the current non-default cable modem configuration and return the unit to its factory default plug-and-play bridging configuration, perform the following task from privileged EXEC mode:

Step	Command	Purpose
1	uBR904#**erase startup config**	Erase the current configuration (assuming the current running configuration has been saved to NVRAM).

After entering this command, perform a warm reset of the Cisco uBR904 cable modem by pressing and holding down the Reset button for less than 10 seconds. For information on the location and operation of the Reset button, refer to the “Physical Description” section in the chapter “Installing the Cisco uBR904 Cable Modem” in the *Cisco uBR904 Cable Modem Installation and Configuration Guide*.

Verify Plug-and-Play Bridging

To verify that the cable modem is configured for Plug-and-Play bridging, enter the **show startup-config** command from privileged EXEC mode. The configuration should look like this:

```
uBR904# show startup-config
Building configuration...
Current configuration:
!
version 12.0
no service pad
no service password-encryption
!
hostname uBR904
!
no ip routing
!
interface Ethernet0
 no ip address
 no ip route-cache
 bridge-group 59
 bridge-group 59 spanning-disabled
!
interface cable-modem0
 no ip address
 no ip route-cache
 no keepalive
 cable-modem downstream saved channel 699000000 36
 bridge-group 59
 bridge-group 59 spanning-disabled
!
ip classless
!
line con 0
line vty 0 4
 login
!
end
```

Customizing the Cable Modem Interface

Different geographical regions and different cable plants use different frequency bands. The Cisco uBR904 cable modem uses a built-in default frequency scanning feature to address this issue. After the cable modem finds a successful downstream frequency channel, it saves the channel and power setting to NVRAM. The cable modem recalls this value the next time it needs to synchronize its frequency or register with the cable service provider's CMTS.

However, you can customize the cable modem's interface configuration if you need to deviate from the default setting that ships with the modem. For example, you might need to specify a different compliant mode, modify the saved downstream channel setting and upstream power value, or enable a faster downstream search algorithm.

Note Most cable network scenarios will not require you to use these commands.

To customize the cable modem interface, perform the following tasks, starting in global configuration mode:

Step	Command	Purpose
1	`uBR904(config)#`**`interface cable-modem 0`**	Specify cable modem interface 0.
2	`uBR904(config-if)#`**`cable-modem compliant bridge`**	Enable DOCSIS-compliant bridging.
3	`uBR904(config-if)#`**`cable-modem downstream saved channel`** *`ds-frequency us-power`*	Modify the saved downstream channel setting and upstream power value. If you do this, you must specify an exact downstream frequency and a power value.[1]
4	`uBR904(config-if)#`**`cable-modem fast-search`**	Enable a faster downstream search algorithm.

1. Use the **no cable-modem downstream saved channel** *ds-frequency us-power* command to remove a saved frequency and power setting from NVRAM.

Note For more information on the use and effects of the commands in Step 3 and Step 4 above, refer to the command reference pages for those commands.

Configuration Examples

Sample Bridging Configuration

This is a typical bridging configuration for a single PC connected to the Cisco uBR904 cable modem. Note that the configuration for multiple PCs (maximum of three) is the same.

```
version 12.0
no service pad
no service password-encryption
!
hostname uBR904
!
!
no ip routing
!
!
!
interface Ethernet0
 no ip address
 no ip route-cache
 bridge-group 59
 bridge-group 59 spanning-disabled
!
interface cable-modem0
 no ip address
 no ip route-cache
 no keepalive
 bridge-group 59
 bridge-group 59 spanning-disabled
!
ip classless
!
line con 0
line vty 0 4
 login
!
end
```

When the cable interface is up, the following lines are included in cable interface configuration:

```
 ip address 172.16.1.40 255.255.0.0
 cable-modem downstream saved channel 699000000 34
```

Sample Routing Configuration

This is a typical routing configuration for the Cisco uBR904 cable modem. Note that the cable IP address and downstream channel are configured automatically.

```
!
version 12.0
no service pad
no service password-encryption
!
hostname uBR904
!
!
!
!
!
interface Ethernet0
ip address 4.0.0.33 255.0.0.0
ip rip send version 2
ip rip receive version 2
!
interface cable-modem0
ip address 172.16.1.40 255.255.0.0
ip rip send version 2
ip rip receive version 2
no keepalive
cable-modem downstream saved channel 699000000 34
no cable-modem compliant bridge
!
router rip
network 4.0.0.0
network 188.188.0.0
!
ip classless
ip route 0.0.0.0 0.0.0.0 172.16.1.1
!
line con 0
line vty 0 4
login
!
end
```

Command Reference

This section describes new and changed commands for the Cisco uBR904 cable modem for Cisco IOS Release 12.0(3)T.

All other commands used with this feature are documented in the Cisco IOS Release 12.0 command references.

- **cable-modem compliant bridge**
- **cable-modem downstream saved channel**
- **cable-modem fast-search**
- **cable-modem upstream preamble qpsk**
- **interface cable-modem**
- **show bridge cable-modem**
- **show dhcp**
- **show interfaces cable-modem**

cable-modem compliant bridge

To enable DOCSIS-compliant transparent bridging for a cable modem interface at startup, use the **cable-modem compliant** command from interface configuration mode. Use the **no** form of this command to disable DOCSIS-compliant bridging for the interface.

cable-modem compliant bridge
no cable-modem compliant bridge

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3 NA.

It is normally not necessary to enter this command in data-over-cable bridging applications because DOCSIS-compliant bridging is enabled by default. If you wish to do full transparent bridging rather than DOCSIS-compliant bridging, use the **no** form of the command, then configure full transparent bridging using CLI commands. See the "Configuring Bridging" section on page 13 for instructions.

Example

The following example shows how to enter the **cable-modem compliant bridge** command for a cable modem interface, starting from global configuration mode:

```
uBR904(config)# interface cable-modem 0
uBR904(config-if)# cable-modem compliant bridge
uBR904(config-if)#
```

Related Commands

cable-modem downstream saved channel
cable-modem fast-search
cable-modem upstream preamble qpsk
interface cable-modem

cable-modem downstream saved channel

To modify the saved downstream channel setting and upstream power value on a cable modem interface, enter the **cable-modem downstream saved channel** command from interface configuration mode. Use the **no** form of this command to remove the saved settings, which will be resaved at the next initialization cycle.

cable-modem downstream saved channel *ds-frequency us-power*
no cable-modem downstream saved channel *ds-frequency us-power*

Syntax Description

ds-frequency	Downstream channel frequency in Hz, which can be from 91000000 to 860000000.
us-power	Upstream power level in decibels per millivolt (dBmV), which can be from 8 to 61.

Default

Enabled

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3 NA.

This command is auto-generated by the operation of the cable MAC layer process. The MCNS DOCSIS RFI specification requires that cable modems remember the downstream frequency and upstream power of the last successfully ranged session. These parameters are called up as the first downstream frequency and upstream power to use the next time the cable modem is booted. This operation dramatically speeds up the channel search.

Use the **no cable-modem downstream saved channel** *ds-frequency us-power* command to remove the saved frequency and power setting from the running configuration, which will be resaved at the next initialization cycle.

Cisco recommends that this command NOT be used by end users of the Cisco uBR904 cable modem.

Example

The following example shows how to remove the downstream frequency of 91000000 Hz and the upstream power level of 33 dBmV from the running configuration of a cable-modem interface, starting from global configuration mode.

```
uBR904(config)# interface cable-modem 0
uBR904(config-if)# no cable-modem downstream saved channel 91000000 33
uBR904(config-if)#
```

Related Commands

cable-modem compliant bridge
cable-modem fast-search
cable-modem upstream preamble qpsk
interface cable-modem

cable-modem fast-search

To enable a faster downstream search algorithm on a cable modem interface, use the **cable-modem fast-search** command from interface configuration mode. Use the **no** form of this command to disable the downstream fast-search feature.

cable-modem fast-search
no cable-modem fast-search

Syntax Description

There are no keywords or arguments for this command.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3 NA.

This feature speeds up the frequency search performed by the cable modem. Normally it takes the cable modem about 30 to 50 seconds to sample 30 to 50 frequencies. The **cable-modem fast-search** command can reduce this search time. However, there might be some cases where this fast-search algorithm might not perform as well as the default algorithm. Trial and error is the only way to discover how well this feature works for your environment.

Example

The following example shows how to enter the **cable-modem fast-search** command, starting from global configuration mode:

```
uBR904(config)# interface cable-modem 0
uBR904(config-if)# cable-modem fast-search
uBR904(config-if)#
```

Related Commands

cable-modem compliant bridge
cable-modem downstream saved channel
cable-modem upstream preamble qpsk
interface cable-modem

cable-modem upstream preamble qpsk

To enable the QPSK modulation scheme in the upstream direction from the cable modem interface to the headend, enter the **cable-modem upstream preamble qpsk** command from interface configuration mode. Use the **no** form of this command to disable upstream modulation for the interface.

cable-modem upstream preamble qpsk
no cable-modem upstream preamble qpsk

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3 NA.

Example

The following example shows how to enter the **cable-modem upstream preamble qpsk** command for a cable modem interface, starting from global configuration mode:

```
uBR904(config)# interface cable-modem 0
uBR904(config-if)# cable-modem upstream preamble qpsk
uBR904(config-if)#
```

Related Commands

cable-modem compliant bridge
cable-modem downstream saved channel
cable-modem fast-search
interface cable-modem

interface cable-modem

To specify the cable modem interface on a Cisco uBR904 cable modem, enter the **interface cable-modem** command from global configuration mode.

interface cable-modem *number*

Syntax Description

number	The interface number of the cable-modem interface on the rear panel of the cable modem.

Default

Disabled

Command Mode

Global configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3 NA.

When this command is entered, the Cisco cable modem switches from global configuration mode to interface configuration mode.

Example

The following example brings up cable modem interface 0 and displays the available cable-modem interface configuration commands:

```
uBR904(config)# interface cable-modem 0
uBR904(config-if)# cable-modem ?
  compliant    Enter compliant modes for interface
  downstream   Downstream channel characteristics
  fast-search  Enable/disable the DS fast search
  upstream     upstream channel characteristics

uBR904(config-if)#
```

Related Commands

cable-modem compliant bridge
cable-modem downstream saved channel
cable-modem fast-search
cable-modem upstream preamble qpsk

show bridge cable-modem

To display bridging information for a cable modem, enter the **show bridge cable-modem** command from privileged EXEC mode.

show bridge cable-modem *number*

Syntax Description

number	The interface number of the cable-modem interface on the rear panel of the cable modem.

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3 NA.

Examples

Following is a sample output for this command:

```
uBR904# show bridge cable-modem 0

Total of 300 station blocks, 298 free
Codes: P - permanent, S - self

Bridge Group 59:
```

Table 1 describes the significant fields shown in the display.

Table 1 Show Bridge Cable-Modem Field Descriptions

Field	Description
Total of 300 station blocks	Total number of forwarding database elements in the system. The memory to hold bridge entries is allocated in blocks of memory sufficient to hold 300 individual entries. When the number of free entries falls below 25, another block of memory sufficient to hold another 300 entries is allocated. Thus, the total number of forwarding elements in the system is expanded dynamically, as needed, limited by the amount of free memory in the router.
Bridge Group	The number of the bridge group to which this interface is assigned.

Related Commands

show dhcp
show interfaces cable-modem

show dhcp

To display the current DHCP settings on point-to-point interfaces, enter the **show dhcp** command from privileged EXEC mode.

show dhcp {**lease** | **server**}

Syntax Description

lease	Show DHCP addresses leased from a server.
server	Show known DHCP servers.

Command Mode

Privileged EXEC

Usage Guidelines

You can use this command on any point-to-point type of interface that uses DHCP for temporary IP address allocation.

Examples

Following is sample output for the **show dhcp lease** command:

```
uBR904# show dhcp lease
Temp IP addr: 188.188.1.40  for peer on Interface: cable-modem0
Temp sub net mask: 0.0.0.0
   DHCP Lease server: 4.0.0.32, state: 3 Bound
   DHCP transaction id: 2431
   Lease: 3600 secs,  Renewal: 1800 secs,  Rebind: 3150 secs
Temp default-gateway addr: 188.188.1.1
   Next timer fires after: 00:58:01
   Retry count: 0   Client-ID: 0010.7b43.aa01
```

Table 3 describes the significant fields shown in the display.

Table 2 Show DHCP Lease Field Descriptions

Field	Description
Temp IP addr	IP address leased from the DHCP server for the cable modem interface.
Temp subnet mask	Temporary subnet mask assigned to the cable modem interface.
DHCP Lease server	IP address of the DHCP server that assigned an IP address to this client.
state	Current state of this client (the cable modem interface). Possible states are Bound, Renew, or Rebinding. For descriptions of these states, see RFC 2131.
DHCP transaction id	Unique number established by the uBR904 before the first request message is sent to the DHCP server. The same transaction id is used as long as the lease keeps getting renewed and is valid. If a new “discover” message is sent, a new transaction id is used.
Lease	Time (in seconds) for which the leased IP address is valid; the duration of the lease.

Table 2 Show DHCP Lease Field Descriptions (Continued)

Field	Description
Renewal	Time interval (in seconds) from address assignment until the client transitions to the renewing state. When the renewal (T1) time expires, the client sends a unicast dhcprequest message to the server to extends its lease. The default value of this timer is 0.5 times the duration of the lease.
Rebind	Time interval (in seconds) from address assignment until the client transitions to the rebinding state and sends a broadcast dhcprequest message to any DHCP server to extends its lease. The default value of this timer (T2) is 0.875 times the duration of the lease.
Temp default-gateway addr	IP address of the router closest to this client on the network.
Next timer fires after	Time in hours, minutes, and seconds until the next timer expires.
Retry count	Number of times the client has sent any message to the DHCP server -- most likely a request message to extend its lease. When the lease is renewed, the Retry count is reset to 0.
Client-ID	MAC address (with optional media type code) that uniquely identifies the client on the subnet for binding lookups.

Following is sample output for the **show dhcp server** command:

```
uBR904# show dhcp server
   DHCP server: ANY (255.255.255.255)
    Leases:   1
    Offers:   1      Requests: 2     Acks: 1     Naks: 0
    Declines: 0      Releases: 0     Bad:  0
    TFTP Server Name: SOHOSERVER
    TIME0: 1.2.0.250,  TIME1: 0.0.0.0
    Subnet: 255.255.255.0
```

Table 3 describes the significant fields shown in the display.

Table 3 Show DHCP Server Field Descriptions

Field	Description
DHCP server	MAC address used by the DHCP server.
Leases	Number of current leased IP addresses.
Offers	Number of offers for an IP address sent to a proxy-client from the server.
Requests	Number of requests for an IP address to the server.
Acks	Number of ‘acknowledge’ messages sent by the server to the proxy-client.
Naks	Number of ‘not acknowledge’ messages sent by the server to the proxy-client.
Declines	Number of offers from the server that have been declined by the proxy-client.
Releases	Number of times IP addresses have been relinquished gracefully by the client.
Bad	Number of bad packets received due to wrong length, wrong field type, or other causes.
TFTP Server Name	Name (if any) configured for the server providing TFTP downloads to the cable modem.
TIME0	IP address of the primary Time of Day (TOD) server.
TIME1	IP address of the secondary Time of Day (TOD) server.
Subnet	Subnet containing the DHCP server.

Related Commands

interface cable-modem
ip address-pool
ip dhcp-server
peer default ip address
show bridge cable-modem
show interfaces cable-modem

show interfaces cable-modem

To display information about the Cisco uBR904 cable modem's cable interface, enter the **show interfaces cable-modem** command from either user EXEC mode or privileged EXEC mode.

show interfaces cable-modem *number* [**accounting** | **counters** | **crb** | **irb** | **type**]

Syntax Description

number	Cable modem interface number.
accounting	(Optional) Displays the number of packets of each protocol type that has been sent through the cable modem interface.
counters	(Optional) Shows MIB counters on the cable interface.
crb	(Optional) Displays concurrent routing and bridging information for each interface that has been configured for routing or bridging. This option does not really apply to the uBR904; it is included because it is part of the subsystem that provides DOCSIS-compliant bridging. For more information, refer to the *Bridging and IBM Networking Command Reference*.
irb	(Optional) Displays integrated routing and bridging information for each interface that has been configured for routing or bridging. This option does not really apply to the uBR904; it is included because it is part of the subsystem that provides DOCSIS-compliant bridging. For more information, refer to the *Bridging and IBM Networking Command Reference*.
type	(Optional) Designed to display information about virtual LANs associated with the interface; however, this option is not supported on the uBR904.

Command Mode

User EXEC or privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.3 NA.

When this command is entered without a keyword, general information about the cable interface is displayed.

Examples

Traffic passing through the cable modem interface is shown in the following example:

```
uBR904# show interfaces cable-modem 0
cable-modem0 is up, line protocol is up
  Hardware is BCM3220, address is 0010.7b6b.7821 (bia 0010.7b6b.7821)
  Internet address is 172.16.1.60/16
  MTU 1500 bytes, BW 27000 Kbit, DLY 1000 usec,
     reliablility 255/255, txload 1/255, rxload 1/255
  Encapsulation DOCSIS, loopback not set, keepalive not set
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:07:04, output 00:00:41, output hang never
  Last clearing of "show interface" counters never
```

```
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
   4495 packets input, 1153221 bytes, 0 no buffer
   Received 8 broadcasts, 0 runts, 0 giants, 0 throttles
   0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
   12841 packets output, 1708272 bytes, 0 underruns
   0 output errors, 0 collisions, 11 interface resets
   0 output buffer failures, 0 output buffers swapped out
```

Table 4 describes the significant fields shown in the display.

Table 4 Show Interfaces Cable-Modem Field Descriptions

Field	Description
cable-modem0 is up	Indicates that the interface is currently active. “Disabled” indicates the interface has received more than 5000 errors in one keepalive interval (10 seconds by default if keepalive is set); “administratively down” indicates the interface has been taken down by an administrator.
line protocol is up	Indicates that the software processes that handle the line protocol believe the interface is usable.
Hardware	Hardware type and MAC address.
Internet address	Internet address followed by the shorthand notation for the subnet mask.
MTU	Maximum Transmission Unit (equivalent of the maximum packet size) for the interface.
BW	Bandwidth of the interface in kilobits per second.
DLY	Delay of the interface in microseconds.
reliability	Reliability of the interface, expressed as a fraction of 255, calculated as an exponential average over a 5-minute period. (255/255 equals 100% reliability.)
tx load/rx load	Load on the interface caused by transmitting and receiving, expressed as a fraction of 255, calculated as an exponential average over a 5 minute period.
Encapsulation/loopback/keepalive	Encapsulation method assigned to the interface.
loopback	Indicates whether or not loopback is set.
keepalive	Indicates whether or not keepalives are set.
ARP type	Type of Address Resolution Protocol configured for the interface.
ARP Timeout	Number of hours, minutes, and seconds an ARP cache entry will stay in the cache.
Last input/output	Number of hours, minutes, and seconds since the last packet was successfully received/transmitted by the interface.
output hang	Number of hours, minutes, and seconds since the interface was last reset because of a transmission that took too long. When the number of hours in any of the “Last..” fields exceeds 24, the number of days and hours is displayed. If the field overflows, asterisks are printed.

Table 4 Show Interfaces Cable-Modem Field Descriptions (Continued)

Field	Description
Last clearing of "show interface" counters	Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31} milliseconds (and less than 2^{32} milliseconds) ago.
Queueing strategy	Type of queueing strategy in effect on the interface.
Output queue/drops	Number of packets in the output queue followed by the size of the queue and the number of packets dropped due to a full queue.
input queue/drops	Number of packets in the input queue followed by the size of the queue and the number of packets dropped due to a full queue.
5 minute input rate 5 minute output rate	Average number of bits and packets received and transmitted per second in the last 5 minutes. If the interface is not in promiscuous mode, it senses network traffic it sends and receives (rather than all network traffic). The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.
bytes input	Total number of bytes, including data and MAC encapsulation, in the error-free packets received by the system.
no buffer	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernet networks and bursts of noise on serial lines are often responsible for no input buffer events.
Received broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets discarded because they were smaller than the medium's minimum packet size. For example, any Ethernet packet less than 64 bytes is considered a runt.
giants	Number of packets discarded because they were larger than the medium's maximum packet size. For example, any Ethernet packet larger than 1518 bytes is considered a giant.
throttles	Number of times the receiver on the port was disabled, possibly due to buffer or processor overload.
input errors	Includes runts, giants, no buffer, CRC, frame, overrun, and ignored counts. Other input-related errors can also cause the input errors count to be increased, and some datagrams may have more than one error; therefore, this sum may not balance with the sum of enumerated input error counts.
CRC	Number of cyclic redundancy checksums generated by the originating LAN station or far-end device that do not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRCs is usually the result of collisions or a station transmitting bad data.
frame	Number of packets received incorrectly, having a CRC error and a noninteger number of octets. On a LAN, this is usually the result of collisions or a malfunctioning Ethernet device.

Table 4 Show Interfaces Cable-Modem Field Descriptions (Continued)

Field	Description
overrun	Number of times the receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different from the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be increased.
abort	Number of packets whose receipt was aborted.
packets output	Total number of messages transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times the transmitter has been running faster than the router can handle.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, as some datagrams might have more than one error, and others might have errors that do not fall into any of the specifically tabulated categories.
collisions	Number of messages retransmitted due to an Ethernet collision. This is usually the result of an overextended LAN (Ethernet or transceiver cable too long, more than two repeaters between stations, or too many cascaded multiport transceivers). A packet that collides is counted only once in output packets.
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
output buffer failures	Number of times the output buffer has failed.
output buffers swapped out	Number of times the output buffer has been swapped out.

To display the number of packets and bytes of each protocol type passing through the cable modem interface, use the **accounting** option with the **show interface cable-modem** command:

```
uBR904# show interface cable-modem 0 accounting
cable-modem0
                Protocol    Pkts In   Chars In   Pkts Out  Chars Out
                      IP         545     185502        159      90240
           Trans. Bridge        3878     964995      12597    1611142
                     ARP          73       3066         86       4128
```

Table 5 describes the fields shown in this display.

Table 5 Show Interfaces Cable-Modem Accounting Descriptions

Field	Description
Protocol	List of protocols operating on the cable-modem interface.
Pkts In	Number of packets of each protocol received on the interface.
Chars In	Number of bytes of each protocol received on the interface.
Pkts Out	Number of packets of each protocol transmitted on the interface.
Chars Out	Number of bytes of cach protocol transmitted on the interface.

MIB counters on the cable interface are displayed in the next example:

```
uBR904# show int cable-modem 0 counters
Cable specific counters:
Ranging requests sent  : 50982
Downstream FIFO full   : 0
Re-requests            : 7277
DS MAC Message Overruns: 0
DS Data Overruns       : 0
Received MAPs          : 254339485
Received Syncs         : 53059555
Message CRC failures   : 0
Header CRC failures    : 1394
Data PDUs              : 5853
DS MAC messages        : 307861745
Valid Headers          : 307869065
Sync losses            : 0
Pulse losses           : 1
BW request failures    : 6
```

Table 6 describes the counters shown in this display.

Table 6 Show Interfaces Cable-Modem Counters Descriptions

Field	Description
Ranging requests sent	Number of ranging requests sent by the uBR904 to the CMTS.
Downstream FIFO full	Number of times the downstream input first-in first-out (FIFO) buffer became full on the uBR904.
Re-requests	Number of times a bandwidth request generated by the uBR904 was not responded to by the CMTS.
DS MAC Message Overruns	Number of times the uBR904's DMA controller had a downstream MAC message and there were no free MAC message buffer descriptors to accept the message.
DS Data Overruns	Number of times the uBR904's DMA controller had downstream data and there were no free data PDU buffer descriptors to accept the data.
Received MAPs	Number of times a MAP message passed all filtering requirements and was received by the uBR904.
Received Syncs	Number of times a timestamp message was received by the uBR904.
Message CRC failures	Number of times a MAC message failed a cyclic redundancy (CRC) check.

Table 6 Show Interfaces Cable-Modem Counters Descriptions (Continued)

Field	Description
Header CRC failures	Number of times a MAC header failed its 16-bit CRC check. The MAC header CRC is a 16-bit Header Check Sequence (HCS) field that ensures the integrity of the MAC header even in a collision environment.
Data PDUs	Total number of data PDUs (protocol data units) of all types received by the uBR904.
DS MAC messages	Number of MAC messages received by the uBR904.
Valid Headers	Number of valid headers received by the uBR904, including PDU headers, MAC headers, and headers only.
Sync losses	Number of times the uBR904 lost timebase sync with the CMTS.
Pulse losses	Number of times the uBR904 did not receive expected timestamp messages from the CMTS.
BW request failures	Number of times the uBR904 sent the maximum number of re-requests for bandwidth allocation and the request was still not granted.

Information about routing and bridging protocols and filtering on the cable modem interface is displayed in the following example:

```
uBR904# show int cable-modem 0 crb

cable-modem0

 Bridged protocols on cable-modem0:
  ip

 Software MAC address filter on cable-modem0
  Hash Len    Address      Matches  Act      Type
  0x00:  0 ffff.ffff.ffff      3877 RCV Physical broadcast
  0x2A:  0 0900.2b01.0001         0 RCV DEC spanning tree
  0x7A:  0 0010.7b43.aa01       573 RCV Interface MAC address
  0xC2:  0 0180.c200.0000         0 RCV IEEE spanning tree
  0xC2:  1 0180.c200.0000         0 RCV IBM spanning tree
```

Table 7 describes the software MAC address filter information for the cable modem interface.

Table 7 Show Interfaces Cable-Modem Routing and Bridging Descriptions

Field	Description
Hash	Hash key/relative position in the keyed list for this MAC address filter.
Len	Length of this entry to the beginning element of this hash chain.
Address	Canonical (Ethernet ordered) MAC address of this filter.
Matches	Number of received packets that match this MAC address.
Act	Action to be taken when this address is looked up; choices are to receive or discard the packet.
Type	MAC address type.

Related Commands

cable-mocem compliant bridge
cable-modem downstream saved channel
cable-modem fast-search
show bridge cable-modem
interface cable-modem

What to Do Next

For additional software configuration information and related documentation, refer to the following publications:

- *Cisco uBR904 Cable Modem Installation and Configuration Guide*
- *Update to the uBR904 Cable Modem Installation and Configuration Guide*
- *Regulatory Compliance and Safety Information for the Cisco uBR904*
- *Troubleshooting Tips for the Cisco uBR904 Cable Modem*
- *Cisco uBR7246 Installation and Configuration Guide*
- *Cisco uBR7223 Installation and Configuration Guide*
- *Cisco uBR7200 Series Configuration Notes*
- *Cisco Network Registrar for the uBR7200 Series*
- *Cisco uBR7246 Universal Broadband Router Features*
- *Cisco uBR7246 Universal Broadband Router Feature Enhancements*
- *MC16 Modem Card for uBR7246*
- *Regulatory and Safety Compliance for the Cisco uBR7246*
- *Regulatory and Safety Compliance for the Cisco uBR7223*